Claims:

1. A method for the heat treatment of fine-grained solids, in particular gypsum, in which the solids are heated to a temperature of 50 to 1000°C in a fluidized bed reactor (1), characterized in that a first gas or gas mixture is introduced from below through a preferably central gas supply tube (3) into a mixing chamber (21) of the reactor (1), the gas supply tube (3) being at least partly surrounded by a stationary annular fluidized bed (2) which is fluidized by supplying fluidizing gas, and in that the gas velocities of the first gas or gas mixture as well as of the fluidizing gas for the annular fluidized bed (2) are adjusted such that the particle Froude numbers in the gas supply tube (3) are between 1 and 100, in the annular fluidized bed (2) between 0.02 and 2 and in the mixing chamber (21) between 0.3 and 30.

2. The method as claimed in claim 1, characterized in that the particle Froude number in the gas supply tube (3) is between 1.15 and 20.

3. The method as claimed in claim 1 or 2, characterized in that the particle Froude number in the annular fluidized bed (2) is between 0.115 and 1.15.

4. The method as claimed in any of the preceding claims, characterized in that the particle Froude number in the mixing chamber (21) is between 0.37 and 3.7.

5. The method as claimed in any of the preceding claims, characterized in that the bed height of the solids in the reactor (1) is adjusted such that the annular fluidized bed (2) extends beyond the upper orifice end of the gas supply tube (3), and that solids are constantly introduced into the first gas or gas mixture and entrained by the gas stream to the mixing chamber (21) located above the orifice region of the gas supply tube (3).

6. The method as claimed in any of the preceding claims, characterized in that fine-grained solids, for example moist gypsum, with a grain size of less than 2 mm, in particular less than 0.2 mm, are supplied as the starting material.

7. The method as claimed in any of the preceding claims, characterized in that hot gas, which is generated in an upstream combustion chamber (26) by burning supplied fuel, possibly with the admixture of a gas containing oxygen, is supplied to the reactor (1) via the gas supply tube (3).

8. The method as claimed in any of the preceding claims, characterized in that the solids are heated in the reactor (1) to a temperature of 150 to 1000°C.

9. The method as claimed in any of the preceding claims, characterized in that air is supplied to the reactor (1) as fluidizing gas.

10. The method as claimed in any of the preceding claims, characterized in that the pressure in the reactor (1) is between 0.8 and 10 bar.

11. The method as claimed in any of the preceding claims, characterized in that, before the heat treatment in the reactor (1), the solids are suspended, dried and/or pre-heated in at least one pre-heating stage (32, 33), comprising a heat exchanger (6, 10) and a downstream separator (8, 12).

12. The method as claimed in any of the preceding claims, characterized in that, after the heat treatment in the reactor (1), the product from the annular fluidized bed (2) of the reactor (1) and/or a separator (5) provided downstream of the reactor (1) is at least partly supplied to a cooling system (34), which comprises in particular an arrangement of a number of cooling stages (35, 19) connected one after the other.

13. The method as claimed in claim 12, characterized in that the product forms in a cooling stage (19) at least one fluidized bed, in which it is cooled by a fluidizing gas, in particular air, and/or a cooling coil (24, 31), formed in the fluidized bed, with cooling medium, in particular water.

14. The method as claimed in claim 12 or 13, characterized in that the gas heated in a cooling stage (19, 17) is supplied to an upstream cooling stage (17), the reactor (1), the combustion chamber (26) and/or a pre-heating stage (32).

15. A plant for the heat treatment of fine-grained solids, in particular for performing a method as claimed in any of claims 1 to 13, comprising a reactor (1) constituting a fluidized bed reactor for the heat treatment, characterized in that the reactor (1) has a gas supply system which is formed such that gas flowing through the gas supply system entrains solids from a stationary annular fluidized bed (2), which at least partly surrounds the gas supply system, into the mixing chamber (21).

16. The plant as claimed in claim 15, characterized in that the gas supply system has a gas supply tube (3) extending upwards substantially vertically from the lower region of the reactor (1) into the mixing chamber (21) of the reactor (1), the gas supply tube (3) being surrounded by a chamber which extends at least partly around the gas supply tube and in which a stationary annular fluidized bed (2) is formed.

17. The plant as claimed in claim 15 or 16, characterized in that the gas supply tube (3) is arranged approximately centrally with reference to the cross-sectional area of the reactor (1).

18. The plant as claimed in any of claims 15 to 17, characterized in that a separator (5) is provided downstream of the reactor (1), for the separation of solids, and that the separator (5) has a solids conduit (6) leading to the annular fluidized bed (2) of the reactor (1) and/or a solids conduit (15) leading to the cooling system (34).

19. The plant as claimed in any of claims 15 to 18, characterized in that a solids conduit (14) leading from the annular fluidized bed (2) of the reactor (1) to the cooling system (34) is provided.

20. The plant as claimed in any of claims 15 to 19, characterized in that, provided in the annular chamber of the reactor (1) is a gas distributor (36) which divides the chamber into an upper annular fluidized bed (2) and a lower gas distributor (36), and that the gas distributor (36) is connected to a supply conduit (37, 27) for fluidizing gas.

21. The plant as claimed in any of claims 15 to 20, characterized in that, provided upstream of the reactor (1) is a combustion chamber (26) with supply conduits (42, 28, 25) for fuel, oxygen and/or heated gas, the exhaust gas of which is passed into the gas supply tube (3).

22. The plant as claimed in any of claims 15 to 21, characterized in that, provided downstream of the reactor (1) is a cooling system (34), comprising direct and/or indirect cooling stages (35, 19), in particular cooling cyclones and/or fluidized bed coolers.